D E C L A R A T I O N

I, Mikio Hippo, residing at 7 th Fl., Kioicho Park Bldg., 3-6, Kioicho, Chiyoda-ku, Tokyo, Japan, hereby declare that I have a thorough knowledge of Japanese and English languages, and that the attached pages contains a correct translations into English of the application documents of Japanese Patent Applications No. 2000-365337 filed on November 30, 2000, 2000-365935 filed on November 30, 2000, 2000-365936 filed on November 30, 2000, 2000-365937 filed on November 30, 2000, 2000-365938 filed on November 30, 2000 and No. 2000-365939 filed on November 30, 2000 in the name of CANON KABUSHIKI KAISHA.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statement were made with the knowledge that willful false statements and the like so made, are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signed this 30th day of October 2008

Mikio HIPPO

Translation of Japanese Patent Application No. 2000-365939

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INHALER AND A DISCHARGE HEAD CONTROL METHOD

[What Is Claimed Is:]

[Claim 1] An inhaler for discharging a medicine in the form of fine droplets and allowing a user to inhale the medicine, characterized by comprising:

storage means storing personal information about the user including information about a prescription for the user;

a tank which contains the medicine and has a code for identifying a type of contained medicine;

a discharge head for discharging a medicine supplied from said tank in the form of fine droplets; and

discharge permission means for permitting operation of said discharge head only when a collation result on the medicine contained in said tank and a medicine written on the prescription indicates coincidence upon reading the code.

[Claim 2] The inhaler according to claim 1, characterized in that said tank and said discharge head are integrally formed.

[Claim 3] The inhaler according to claim 1, characterized in that said discharge permission means inhibits operation of said discharge head with respect

to a usage pattern different from a formula written in the prescription.

[Claim 4] The inhaler according to claim 1, characterized in that the inhaler further comprises input means, and said discharge permission means permits operation of said discharge head only when the information stored in said storage means coincides with the information input from said input means.

[Claim 5] The inhaler according to claim 1, characterized in that the inhaler further comprises an authentication sensor for performing biometrical authentication with respect to the user, and said discharge permission means permits operation of said discharge head only when a biometrical characteristic of the user stored in said storage means coincides with information from said authentication sensor.

[Claim 6] The inhaler according to claim 1, characterized in that the code is electrically readable.

[Claim 7] The inhaler according to claim 1, characterized in that the code is optically readable.

[Claim 8] The inhaler according to claim 1, characterized by further comprising means for inhibiting reuse of said tank when inhaling operation is performed a predetermined number of times.

[Claim 9] The inhaler according to claim 1, characterized by further comprising means for inhibiting reuse of said discharge head when inhaling

operation is performed a predetermined number of times.

[Claim 10] A discharge head control method for an inhaler being provided with storage means storing personal information about a user including information about a prescription for the user, a tank which contains the medicine and has a code for identifying a type of contained medicine, and a discharge head for discharging a medicine supplied from the tank in the form of fine droplets,

wherein said method comprises the steps of:

collating the medicine contained in the tank and a medicine written on the prescription upon reading the code,

enabling operation of the discharge head only when the collation result indicates coincidence of the both.

[Claim 11] The method according to claim 10, characterized in that operation of the discharge head is inhibited with respect to a usage pattern different from a formula written in the prescription.

[Claim 12] The method according to claim 10, characterized in that the inhaler further comprises input means, and operation of the discharge head is permitted only when the information stored in the storage means coincides with the information input from the input means.

[Claim 13] The method according to claim 10,

characterized in that the inhaler further comprises an authentication sensor for performing biometrical authentication with respect to the user, and operation of the discharge head is permitted only when a biometrical characteristic of the user stored in the storage means coincides with information from the authentication sensor.

[Claim 14] The method according to claim 10, characterized in that reuse of the tank is inhibited when inhaling operation is performed a predetermined number of times.

[Claim 15] The method according to claim 10, characterized in that reuse of the discharge head is inhibited when inhaling operation is performed a predetermined number of times.

[Claim 16] A storage medium characterized by storing a program code for implementing the discharge head control method defined in any one of claims 10 to 15.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention]

The present invention relates to an inhaler and a discharge head control method and, more particularly, to an inhaler for discharging a medicine in the form of fine droplets and allowing a user to inhale the medicine and a discharge head control method for the inhaler.

[0002]

[Prior Art]

With recent medical and scientific advances, the average life span of people is prolonged, and we are witnessing an aging society. On the other hand, owing to changes in eating habits and living environment, environmental contamination, viruses, and germs, new diseases and infections have been found. This has provoked anxiety among people about health. In so-called advanced nations, in particular, an increase in the number of people who suffer lifestyle-related illnesses such as diabetes and hyperpiesia raises a problem.

[0003]

An increase in the number of medical facilities has not kept pace with an increase in the number of such patients. In addition, in some areas, there are no medical facilities that allow people to regularly visit. Under the circumstances, concerns are rising about future measures including policies against such situations.

[0004]

Remote medical systems and home health management systems have therefore been proposed, which allow the aged and people suffering lifestyle-related diseases and chronic diseases to receive diagnoses from doctors and perform daily health management.

[0005]

A typical arrangement of such systems is that a target individual installs a terminal at his/her home, and connects it to a server in a medical facility or center through a communication line such as the Internet so as to input/transmit answers for a medical inquiry and measurement values such as a blood pressure and bodily temperature from the terminal. A nurse or doctor then checks the data collected in the server and returns information indicating the presence/absence of an abnormality or message.

[0006]

To manage such a medical system, clinical records (clinical charts) of users electronically recorded as electronic clinical charts and a medical database storing the data of the electronic clinical charts, various measurement values, and the like are required. Various proposals have been made about such electronic clinical charts and medical databases from various fields.

[0007]

Electronic clinical charts, in particular, are effective in preventing medical malpractices and medication errors, which have become problems. A great deal of attention has been paid to an electronic clinical chart as a means for satisfying the patient's right to know by disclosing its contents to the patient

or patient's family.

[0008]

[Problems That the Invention Is to Solve]

Terminals used in the above medical systems include a general personal computer having a display screen and input device and a dedicated terminal capable of measuring a specific value such as a blood pressure.

[0009]

When a device such as a general personal computer is to be used as a terminal, settings for the device and its operation method become complicated. This limits people who can use such terminal.

[0010]

Assume that dedicated terminals are used. In this case, if a user suffers a plurality of diseases or ailments and needs to perform various measurements, he/she must use a plurality of dedicated terminals. This is cumbersome operation and also increases burden on the user.

[0011]

In a conventionally proposed medical system, if, for example, a user suffers a chronic disease or the like and needs to periodically take a medicine, the user must administer and manage a medicine by himself/herself, and there is no support function on the system side. For this reason, the burden of

administration and management of medicines on users cannot be reduced.

[0012]

More specifically, of diabetic patients who are currently on increase, patients suffering type I insulin-dependent diabetes mellitus must periodically take insulin because no insulin is secreted from the pancreas. Administration of insulin is currently performed by subcutaneous injection. This imposes great physical and mental burden on patients.

[0013]

To reduce the burden on such patients, a pen-type syringe having a thin needle that makes the patients feel little pain has been developed. Type I diabetic patients often work like able-bodied persons except that the patients must periodically take insulin. It is difficult for such a patient to take insulin at proper times because he/she feels dislike to make an inject in the presence of others even with a pen-type syringe.

[0014]

Under the circumstances, a method of discharging a medicine in the form of droplets and making them reach the lungs together with inhaled air, thereby administering the medicine through the lungs instead of injection.

[0015]

Assume that patients can easily administer medicines by themselves. In this case, problems are posed concerning how to handle an instance where a patient takes a wrong medicine or does not take a proper amount of medicine or at wrong intervals.

[0016]

The present invention has been made in consideration of the above situation, and has as its object to provide an inhaler and a discharge head control method, which can prevent a patient from loading a wrong medicine and erroneously operating the inhaler, and also allows the patient to accurately and easily take a medicine by himself/herself.

[0017]

[Means of Solving the Problems]

In order to achieve the above object, according to the present invention, there is provided a inhaler for discharging a medicine in the form of fine droplets and allowing a user to inhale the medicine, comprising

storage means storing personal information about the user including information about a prescription for the user,

a tank which contains the medicine and has a code for identifying a type of contained medicine,

a discharge head for discharging a medicine supplied from the tank in the form of fine droplets, and

discharge permission means for permitting operation of the discharge head only when a collation result on the medicine contained in the tank and a medicine written on the prescription indicates coincidence upon reading the code.

[0018]

In addition, in order to achieve the object, according to the present invention, there is provided a discharge head control method for an inhaler comprising providing the inhaler with storage means storing personal information about a user including information about a prescription for the user, a tank which contains the medicine and has a code for identifying a type of contained medicine, and a discharge head for discharging a medicine supplied from the tank in the form of fine droplets,

wherein said method comprises the steps of collating the medicine contained in the tank with a medicine written on the prescription upon reading the code, and enabling operation of the discharge head only when the collation result indicates coincidence of the both.

[0019]

With the arrangement or the processing of the invention, in administering a medicine by using the inhaler, a patient can be prevented from loading a wrong medicine and erroneously operating the inhaler,

and the patient can accurately and easily take a medicine by himself/herself.

[0020]

[Embodiments]

Preferred embodiments of the present invention will now be described in detail in accordance with the accompanying drawings. As an embodiment of the health management system of the present invention, a medical health management system will be described.

[0021]

[Overall Arrangement]

Fig. 1 is a block diagram showing the overall arrangement of a medical health management system according to this embodiment. As shown in Fig. 1, this embodiment is comprised of a database 100, medical facility terminal 110, pharmaceutical company terminal 120, drugstore terminal 130, and user terminals 200A to 200N. Fig. 1 shows one each of the database 100, medical facility terminal 110, pharmaceutical company terminal 120, and drugstore terminal 130. Obviously, however, this arrangement is merely an example, and each component may include a plurality of identical ones. In addition, Fig. 1 shows only the four user terminals 200A to 200N (to be generically referred to as a user terminal 200 hereinafter). In practice, however, many user terminals are connected.

[0022]

Fig. 2 is a view showing data to be handled in this embodiment. As shown in Fig. 2(A), the embodiment handles the following data as data about each individual to be registered: basic data including an address, name, date of birth, contact, occupation, place of employment, and the like, identification data including an ID (a number if numbers are assigned to all the people; otherwise, an insurance card number or the like), personal code number, alphanumeric characters such as a password, and biometrical authentication data such as fingerprint, voiceprint, palmprint, face, iris, or retinal blood vessel pattern, health insurance data including a number, type, usage log, and the like, electronic medical and prescription data (electronic clinical chart) for each individual, including a consultation record, prescription, medication data, hospitalization record, case history, family case history, and the like, and data of measurement values obtained by a health examination. Data of a designated medical facility as the emergency contact and inhaler set data (to be described later) are also handled as personal data.

[0023]

In addition, as shown in Fig. 2(B), data handled as medical data are: medical facility data including a registration number, location, contact, registered doctors, facilities, and the like, pharmaceutical

company data including a registration number, location, contact, medicines handled, scale, and the like, drugstore data including registration number, location, contact, medicines handled, pharmaceutist name, and the like, drug data including a drum name, effects, cautions, and the like, and inhaler data (not shown) including data about handling and maintenance of an inhaler.

[0024]

All these data are stored in the database 100. The data about each individual are also stored in each user terminal 200 in the form of a detachable memory card.

[0025]

The database 100 is a medical database that is installed within, for example, a predetermined range, e.g., an administrative area, and serves to store personal data of each resident in this area and medical data. This database 100 may be installed in a special facility or designated special hospital in the administrative area. The respective databases are connected to each other so that when a given resident is to receive a medical treatment in an area other than the residence area or moves from the residence area, access to necessary data can be made.

[0026]

The medical facility terminal 110 is installed in

each medical facility and connected to the database 100. The medical facility terminal 110 has a slot in which the memory card of the user terminal 200 is inserted. In a consultation, a doctor or nurse working at the medical facility inserts the memory card of the user terminal 200 carried by the patient into the medical facility terminal 110 to read out personal data about the patient who has visited for a medical examination so as to use the data as reference data for the consultation. The doctor or nurse also updates the data in the database 100 and the data of the electronic clinical chart in the memory card of the patient on the basis of the consultation result.

[0027]

The prescription data to be recorded at this time includes an expiration date. When the patient takes a consultation again within the expiration date, a new expiration date is set as needed.

[0028]

In the consultation, the doctor refers to medicine data as sell as the personal data about the patient. If the patient suffers a complication (e.g., suffers a visceral disease and cardiovascular disease at the same time), the doctor uses the above data as reference data in making a determination on prescription contents that are competitive. In such a case, the doctor may give the patient the information

(informed consent) to give priority to the prescription desired by the patient.

[0029]

If the DNA analysis result on each patient is recorded on the memory card of the patient or database 100, a prescription can be determined by using techniques called gene diagnosis and gene therapy instead of the conventional average/statistical techniques.

[0030]

The pharmaceutical company terminal 120 is installed in each pharmaceutical company and connected to the database 100. A person who works at the pharmaceutical company accesses the database 100 from this terminal to check inventory data about medicines in a medical facility or drugstore and update the shipment data of medicines that are supplied. In addition, he/she processes production control data on the basis of these data.

[0031]

The drugstore terminal 130 is installed in each drugstore and connected to the database 100. This terminal has a slot in which the memory card of the user terminal 200 is inserted. A person who works at the drugstore inserts the memory card of the user terminal 200 carried by a customer into the drugstore terminal 130 to read out customer's prescription data.

In addition, the person accesses the database 100 from this terminal to read out the prescription data on the customer who has visited the drugstore and collate the data with the corresponding data in the database 100. When the two data coincide with each other, he/she sells the corresponding medicine to the customer. The person then updates the medication data in the database 100 and customer's memory card on the basis of the sold medicine.

[0032]

In this case, if the ID or biometrical authentication information of a person who acts as an alternate is registered in the database 100 in advance, a family member, caretaker, or the like, other than the patient himself/herself, can receive a medicine.

[0033]

If the user makes a contract for electronic commerce (EC) with a financial facility in which the user has an account, a credit card company, or the like in advance, he/she can make a payment through the user terminal 200 in purchasing a medicine without actually paying for the medicine on the spot. This applies to charges for a consultation and medicine which are paid to a medical facility.

[0034]

The user terminal 200 is compact and lightweight to allow the user to always carry it. Each terminal is

made to correspond to a specific individual and incorporates a detachable memory card storing data about the user himself/herself as described above. The terminal has a radio communication function and an input/output device for supporting user's health management, and is connected to the database 100 by radio communication, as needed.

[0035]

[User Terminal]

Fig. 3 is a block diagram showing the arrangement of the user terminal 200. The user terminal 200 of this embodiment includes a controller 201 including a CPU for controlling the overall terminal, an inhaler 202 serving as an input/output device for supporting user's health management, a communication unit 203 for supporting radio communication, an internal memory 204 storing control programs and various data, a memory card 205 storing personal data, an I/O interface 206, key switches 207 including a ten-key pad and various switches such as an emergency notification (emergency) switch, a display/speech output unit 208 including a liquid crystal display, microphone, speaker, and the like, a sensor 209 for biometrical authentication, and a rechargeable battery (not shown) serving as a power supply such as a secondary battery.

[0036]

The inhaler 202 includes a tank 2022B in which a

predetermined amount of liquid medicine is stored, a discharge head 2022A for discharging the medicine, supplied from the tank, in the form of fine droplets or microdroplets, a control unit 2021 for driving/controlling the cartridge 2022, and a sensor 2023 for reading a code attached to a cartridge or tank or detecting the condition of inhaling (negative pressure) of the user. The inhaler 202 discharges a liquid medicine in the form of fine droplets on the basis of the ink-jet scheme using heat to form mist or aerosol. When the user inhales it, the medicine is administered to the user's body through the lungs.

[0037]

This administration method replaces the administration method using a syringe to facilitate administration of a medicine by a patient himself/herself and reduce his/her mental and physical burdens.

[0038]

The communication unit 203 is arranged to perform speech communication based on a proper communication scheme using the ten-key pad of the key switch 207 and the display/speech output unit 208 and communicate data with the database 100 by radio.

[0039]

Although the radio communication scheme to be used is not specifically described, the scheme used in

a currently available mobile communication system (e.g., the cell phone system, PHS system, or car phone system), a satellite system, or a Bluetooth system may be used.

[0040]

The internal memory 204 may be a read-only medium such as a ROM or a programmable storage medium to allow the user to update or change a program through the communication unit 203.

[0041]

The memory card 205 is at least re-recordable, detachable storage medium such as a semiconductor storage medium, MO, CD-R, CD-RW, or compact magnetic disk.

[0042]

The I/O interface 206 is designed to selectively connect external input/output devices 250 such as various measurement sensors and printers when the user is to measure a blood pressure, pulse, blood glucose level, bodily temperature, urine protein, or the like or print his/her measurement data.

[0043]

The user terminal 200 in this embodiment is integrated with the inhaler 202. However, this inhaler 202 may be a detachable discrete device serving as one of the external input/output devices 250 like other medication devices and the above measurement sensors.

[0044]

The authentication sensor 209 is a sensor for performing biometrical authentication with respect to the user by using a fingerprint, voiceprint, palmprint, face, iris, retinal blood vessel pattern, or the like to allow only the registered person to use the user terminal 200.

[0045]

Although not shown, the user terminal 200 has a navigation function of detecting the current position of the terminal by using the intensity of a radio wave received from a GPS or a base station in a radio telephone network and indicating a route to a nearby medical facility or drugstore by using map information.

[0046]

[Security Measures]

The medical health management system of this embodiment must be configured to satisfactory protect data because the data handled by the system are about privacy and important medical data. In addition, to prevent any medical malpractice and operation error, this system must be configured to perform failsafe operation.

[0047]

For example, data is preferably stored in the database 100 by a scheme that allows only additional writing (additional recording). However, a specific person in charge may overwrite certain old data upon

backing up the data to another storage medium. In order to suppress an excessive increase in the necessary capacity of the memory card of the user terminal 200, data that has aged a predetermined number of years may be overwritten.

[0048]

The database 100 sets an access right for each data item with respect to each of the terminals to which the database 100 is connected, including the medical facility terminal 110, pharmaceutical company terminal 120, drugstore terminal 130, and user terminal 200.

[0049]

More specifically, the medical facility terminal 110 can access all the data in the database 100, but can write only part of the data about the medical facility, the data of a usage log of the health insurance card carried by a patient who has visited the medical facility, the data of a clinical chart, and the data of measurement values obtained by a health examination and the like. The drugstore terminal 130 can access personal prescription data and medication data when the memory card of the user terminal of the customer is inserted in the drugstore terminal and the IDs coincide with each other, but can normally access only data about medicines and data about pharmaceutical companies. The drugstore terminal 130 can access only

data about medicines and data about inventory conditions in medical facilities and drugstores.

[0050]

In addition, an ID, personal code number, password, and the like must be input to operate each of these terminals. Biometrical authentication may also be performed by using a sensor similar to that of the user terminal 200.

[0051]

Since the database 100 is connected to the user terminal 200 by radio, especially strict security measures must be taken. The user terminal 200 can access only the personal data about the user and can write only a usage log of medicines (medication data) and data obtained by measurement done by the user himself/herself. When the user accesses the database 100 from the user terminal 200, biometrical authentication is performed by using the authentication sensor 209 in addition to authentication using alphanumerical characters such as an ID, personal code number, password. In communicating data, an encryption technique is preferably used to prevent leakage and tapping (eavesdropping).

[0052]

In this embodiment, security measures are also taken for medicines prescribed to the user to prevent a usage error, medication error, and operation error.

[0053]

Every time medication is performed by using the inhaler 202 of the user terminal 200, the cartridge 2022 or tank 2022B is exchanged with a new one. Therefore, each cartridge or tank is packaged independently to allow the user to easily discern whether it is opened or not. One of the above components may be exchanged with a new one for each medication in accordance with the medicine or discharge method to be used. For the sake of simplicity, however, assume that the tank 2022B is exchanged.

[0054]

When only a tank is exchanged for each medication, a discharge head is used a plurality of number of times. In order to ensure high discharge performance, however, when a given cartridge is used a predetermined number of times or a predetermined period of time has elapsed after the cartridge is loaded, a warning that prompts the user to exchange the cartridge with a new one is preferably provided by picture or sound. In addition, the discharge head is preferably designed such that a heater for generating heat energy is disconnected to inhibit the user from performing actual inhaling operation. When a new cartridge is loaded, the user is made to input his/her ID or password so as to be authenticated again.

[0055]

Wrong medicine administration is preferably prevented in the following manner. An optically or electrically readable code is attached the tank 2022B. When the tank 2022B is loaded into the user terminal 200, the information of the code is collated with the medicine data written on the electronic clinical chart stored in the memory card 205. If a tank containing a medicine contradicting with the electronic clinical chart is loaded, the patient tries to take a medicine in amount exceeding the dose designated by a doctor, or the patient takes a medicine at improper intervals, a warning is provided by picture or sound, and actual inhaling operation is inhibited.

[0056]

Attaching a similar code to the cartridge 2022 can also effectively prevent a wrong cartridge from being loaded. In addition, since each cartridge has an electrical terminal for connection to the control unit 2021, the type of cartridge may be identified by using this terminal.

[0057]

If a used tank is refilled with a medicine and reused, a deterioration in the purity of the medicine or bacterial contamination may occur. This can be effectively prevented as follows. The outer wall of a tank is made of a metal so as to prevent refilling or the above code is overwritten or rewritten to prevent a

read of the code after a medicine is used. Alternatively, tanks or medicines themselves may be colored in different colors for the respective prescriptions to allow the user to easily identify them, or the entire inhaler portion is exchanged with a new one in using a different medicine to prevent mixture of medicines.

[0058]

Furthermore, to perform administration of a medicine at proper intervals based on a prescription, the patient is preferably informed of the timing of administration of the medicine by picture, sound, vibration, or the like.

[0059]

In actually operating the inhaler, the user is preferably made to input his ID or password to authenticate personal identification again. In addition, when the user makes an operation error or a device fault is detected during operation, the operation of the inhaler is preferably stopped immediately for safety.

[0060]

Since the user terminal in this embodiment is battery-driven, in order to prevent the battery from running out during inhaling operation, the following operation is required. The remaining power of the battery is checked. If one inhaling operation cannot

be done with the remaining capacity, inhaling operation is inhibited. Alternatively, the patient must be notified in advance that the battery will run out after a few inhaling operations. In addition, if the remaining capacity of the battery becomes small, the operation mode may be switched to the power save mode in which the power consumption is smaller than that in the normal discharge mode by, for example, prolonging the discharge time.

[0061]

In addition, in order to protect the discharge surface (nozzle) of the discharge head and maintain high discharge performance from the hygienic viewpoint, the nozzle surface is capped to prevent a medicine residue on the surface from being dried and fixed and also prevent unnecessary medicine from leaking. This cap is preferably integrated with a cap for the inhaler.

[0062]

[Emergency Notification]

The user terminal 200 in this embodiment is made to enter the emergency notification mode by continuously pressing the emergency notification (emergency) switch on the key switch 207 of the user terminal 200 for a predetermined period of time when the condition of the patient abruptly changes or abnormality occurs.

[0063]

Fig. 9 is a view showing an example of the contents of the emergency notification mode. As shown in Fig. 9, when the user terminal in this embodiment enters the emergency notification mode, a menu window is displayed. If the user performs no operation for a predetermined period of time after the menu window is displayed, it is determined that a serious condition has occurred, and emergency notification is performed. In this emergency notification mode, an ambulance is automatically called and a notification is automatically made to a preset contact point such as a family member.

[0064]

The items prepared on the menu screen for emergency notification include a contact to a designated doctor, notification of additional medical contents, designation of emergency treatment contents, navigation, urgent speech communication, and the like.

[0065]

"Urgent speech communication" is done by the user himself/herself, if he/she can make it, to make a contact to an emergency facility so as to give information about his/her condition or to make a contact to a doctor or family.

[0066]

"Navigation" is the function of indicating a route to a nearby medical facility or drugstore or the

one which can supply the medicine used by the patient on the basis of the medical data stored in the database 100.

[0067]

[Cartridge and Tank]

A cartridge in this embodiment discharges a medicine in the form of fine droplets on the basis of the ink-jet scheme using heat. This scheme is basically the same as the so-called bubble jet scheme practiced in printing apparatuses like printers. However, this scheme has several characteristic features in a discharge head and tank which differ from those of printing apparatuses.

[0068]

For example, a discharge head is made of a material plated with gold, ceramic material, or glass material. In addition, the arrangement of discharge openings (nozzles) and the shape of each discharge opening are changed in accordance with the type of medicine discharged and the method of medication (e.g., whether to need to reach the lungs or not).

[0069]

A medicine to be contained in a tank may be colored to allow the user to visually check the remaining amount, or may be mixed with a saccharide or polysaccharide, which tends to be scorched, in advance to prevent the property of the medicine from being

changed by heating. Furthermore, the amount of medicine to be contained in the tank is preferably determined by adding the amount of medicine required for recovery processing performed when a discharge error occurs during operation or performed before or after inhaling operation to the amount of medicine required for one medication so as to leave a certain amount of medicine when discharge operation is properly performed.

[0070]

A tank in this embodiment has a double structure. That is, an outer wall made of a metal or the like is integrally formed with an inner wall made of a flexible member whose shape changes in accordance with the amount of medicine contained. This tank differs from an ink tank used in the general ink-jet scheme in that it has neither porous absorber inside nor atmosphere communication port.

[0071]

Tanks are packaged and supplied, for example, a predetermined number of tanks at a time. In this case, instruments and jigs such as droppers and sterile absorbent gauzes for maintaining discharge heads and caps are preferably packaged together.

[0072]

As described above, in this embodiment, every time medication is performed, the tank 2022B is

exchanged with a new one, and the cartridge 2022 is also exchanged after a predetermined number of times of medication or at predetermined intervals. The exchanged cartridges and tanks are effectively recycled in the following manner.

[0073]

Cartridges and tanks are manufactured by a pharmaceutical company and supplied to patients through pharmacies belonging to medical facilities and ordinary drugstores. As described above, when a patient is to obtain a cartridge or tank, he/she inserts the memory card into the medical facility terminal 110 or drugstore terminal 130. The prescription data stored in the memory card is then collated with the prescription data stored in the database 100. Since medicine data includes the data of a medicine used in the past, whether the patient has already used the same type of cartridge or tank can be easily known.

[0074]

If the patient has used the same type of cartridge or tank, he/she brings it with him/her and exchanges it with a new one. In this case, if information indicating whether the cartridge or tank has been collected is also recorded as a medicine usage log in the medicine data, collection can be done more reliably.

[0075]

The cartridge or tank is collected to the pharmaceutical company through a medical facility or drugstore. The outer appearance and function of the cartridge or tank are then checked. The cartridge or tank that can be further used is cleaned, sterilized/disinfected, and refilled with a medicine. After the information of the code on the cartridge or tank is rewritten, it is reused.

[0076]

[Inhaling Operation]

Processing in actual inhaling operation using the user terminal 200 in this embodiment will be described next with reference to the flow chart of Fig. 4.

[0077]

First of all, it is checked whether adjustments for the administration of a medicine have been done (step S301). This adjusting operation includes the initialization step of registering data such as the amount of a medicine for one medication and medication intervals (step S302), the test inhaling step of determining discharge conditions by measuring the amount of air inhaled by each user and a profile (step S303), and the decision step of checking whether the adjustments are done properly as a result of the test inhaling (step S304).

[0078]

This adjusting operation is performed under the

guidance of an expert, e.g., a doctor when it is diagnosed that a medicine must be administered. The measured amount of air inhaled, the measured profile, and the determined discharge conditions are stored as inhaler setting data in both the database 100 and the memory card 205 of the user terminal 200.

[0079]

To perform actual inhaling operation, a cartridge and/or tank are/is loaded into the inhaler 202 (step S305). To allow the user to perform the operation, authentication with respect to the user is then performed on the basis of a combination of one of an ID , personal code number, and password, and a biometrical authentication means such as a fingerprint (step S306).

[0080]

Before actual inhaling operation, inhalation/recovery processing is performed by using instruments such as an inhaling jig (step S307). The user then holds the discharge opening end of the inhaler in his/her mouth and executes inhaling operation (step S308). The inhaler starts discharging the medicine upon detecting the inhalation by the user with a negative pressure sensor or the like. While the medicine is discharged, the user terminal preferably generates a signal sound or the like. When a predetermined amount of medicine is discharged after

the user repeats inhalation several times (step S309), the inhaling operation is terminated. The end of inhalation is preferably informed by signal sound or indication.

[0081]

[Driving Control of Discharge Operation]

In this embodiment, a liquid medicine is discharged in the form of fine droplets on the basis of the ink-jet scheme using heat. In this scheme, a driving waveform is formed into a pulse-like shape to control the number of droplets discharged on the basis of the number of pulses. This scheme is therefore suited to accurately managing the amount of liquid discharged.

[0082]

In this embodiment, however, to use this scheme for medical treatment, discharging control is performed differently from that in a printing apparatus. More specifically, the printing apparatus prints by discharging ink downward on a print medium such as a paper sheet. In contrast to this, the inhaler in this embodiment must discharge a medicine in the form of mist or aerosol and make the medicine reach the lungs, together with the air inhaled by the user.

[0083]

For this reason, control must be performed to decrease the size of each droplet to a size much

smaller than that in the general printing apparatus and reliably discharge droplets with such a small size by a proper amount. If the size of each droplet decreases, the kinetic energy of discharged droplets is low. These droplets need not be discharged in almost one direction as in a printing apparatus, and the droplets discharged in various directions may fly and collide with each other.

[0084]

In this embodiment, therefore, driving parameters are changed in accordance with the profile (pattern) of air inhalation. For example, in inhaling air, the amount of air inhaled per unit time is large at the start time point, and decreases immediately before the end of inhalation. If, therefore, the medicine is to be discharged a plurality of number of times within an inhalation time (one to two sec), different discharging speeds, different driving frequencies, and the like are set for the first discharge operation and the last discharge operation. Alternatively, the discharge scheme, the size of each droplet, and the main droplet/sub-droplet ratio may be changed. The timing at which these driving parameters are changed is preferably stored in the memory card in association with the medicine to be used.

[0085]

Furthermore, the profiles of air inhalation vary

among individuals owing to ages, sexes, physiques, and the like. For this reason, even with the same prescription, the profiles must be finely adjusted (tuned) in accordance with the respective users. This operation will be described with reference to the portion described in association with steps S302 to S304 in the flow chart of Fig. 4.

[0086]

To check whether inhalation is accurately performed, discharged droplets are preferably monitored by an optical detection means or the like. In this case, if inhalation is not properly performed, a warning is preferably generated. As a detection method, for example, a method of detecting reflected light, refracted light, transmitted light, or scattered light or a coloring matter or fluorescent agent mixed in a medicine or a method using a laser may be used.

[0087]

[Flow of Medicine]

The flow of a medicine (cartridge and tank) in this embodiment will be described below with reference to Fig. 5.

[0088]

The medicines manufactured by a pharmaceutical company are supplied to medical facilities and drugstores. Assume that it is required for a user (patient) to take a medicine as a result of

consultation with a doctor. In this case, if, for example, the user visits the medical facility for the first time, he/she receives a medicine for a predetermined number of days from the pharmacy of the medical facility from which he/she has taken the consultation.

[0089]

In the second or subsequent visit with a consultation, the user receives a medicine from the pharmacy of the medical facility in the same manner as described above. At this time, the previously received and used medicine is exchanged with a new one, and the data of the new medicine is written in the medication data on the electronic clinical chart.

[0090]

If no consultation need be taken, the user may receive the medicine from a drugstore. In this case as well, the previously received and used medicine is exchanged with a new one, and the data of the new medicine is written in the medication data on the clinical chart by using a drugstore terminal.

[0091]

The used medicine received from the patient is collected from the medical facility or drugstore to the pharmaceutical company and recycled in the above manner.

[0092]

[Flow of Data]

Fig. 6 is a view schematically showing the flow of data in this embodiment.

[0093]

As shown in Fig. 6, the health management system according to this embodiment has the database 100 as a main component, which manages data in a centralized manner. The respective terminals also manage necessary information in a decentralized manner.

[0094]

The medical facility terminal 110 reads out medicine data from the database 100. In a consultation, the medical facility terminal 110 reads out the personal data of the patient from the memory card of the user terminal 200, collates the data with the data read out from the database 100, and writes the data of a health insurance card and electronic clinical chart in the database 100 and the memory card of the patient.

[0095]

The pharmaceutical company terminal 120 reads out inventory data on medicines in medical facilities and drugstores from the database 100, and writes the data of shipped medicines as shipment data in the database 100. If a new medicine is developed or new effect is found, the pharmaceutical company terminal 120 writes new medicine data in the database 100.

[0096]

The drugstore terminal 130 reads out prescription

data and medication data from the memory card of the user terminal 200 of the patient when he/she visits the drugstore, and collates the data with the prescription read out from the database 100. The medication data about the medicine purchased by the patient is written in the memory card and the database 100.

[0097]

The measurement data obtained by the patient himself/herself using a medical diagnostic instrument or outside the medical facility is written in the memory card of the user terminal 200 of the patient. This measurement data is written in the database 100, as needed, through the medical facility terminal 110. In addition, in response to a request from the patient, the data of the electronic clinical chart or navigation data about a nearby medical facility or drugstore is read out from the database 100.

[0098]

[Specific Examples]

Specific examples of how health management is performed for several patients by using the health management system according to this embodiment will be described below.

[0099]

Assume that in the following specific examples, each patient has already possessed the user terminal 200 having a memory card which is issued by a public

facility such as a public office or a medical facility from which the patient has taken a period medical checkup and stores basic data, identification data, health insurance data, and measurement data.

[0100]

(1) Insulin-Treated Patient

The flow charts of Figs. 7 and 8 show examples of processing to be performed when a consultation is performed and a medicine is supplied, respectively. An example of a patient who needs insulin treatment will be described below with reference to these flow charts.

[0101]

A patient A was told in a periodic medical checkup that his/her blood glucose level was high, and hence visited a nearby medical facility to take a consultation. The patient removed the memory card from this/her user terminal and handed it to a doctor. The doctor inserts the patient's memory card into an medical facility terminal (step S701). The patient then consulted the doctor (step S702). As a result of the consultation, this case was diagnosed as type I insulin-dependent diabetes mellitus, and the patient must periodically medicated with insulin. As a medicine to be prescribed, a mixed formulation of an intermediate type medicine and an immediate type medicine is determined, and the patient was obliged to take 20 units of each medicine within 30 min before

breakfast and dinner. Upon consulting with the doctor, standard intake times were set, and an electronic clinical chart was formed (step S703).

[0102]

The data of this electronic clinical chart was written in the memory card of the user terminal 200 of the patient and the database 100. At this time, the data of a photograph of the patient's face and a fingerprint of the patient were newly written as authentication data. The patient A selected pulmonary inhalation as a method of taking insulin (step S704), and would use the inhaler of the user terminal 200 for the first time.

[0103]

As described in association with steps S302 to S304 in Fig. 4, the inhaler setting data about the patient A was registered in the memory card and database under the guidance of the doctor (step S705).

[0104]

Upon completion of the above processing, prescription data was created/updated (step S706), and the patient's memory card was removed from the medical facility terminal and returned to the patient (step S707), thus terminating the processing at the time of consultation.

[0105]

The patient A went to the pharmacy of the medical

facility while carrying the user terminal 200 to receive a medicine. The patient handed his/her memory card to a person in charge in the pharmacy, and the person inserted the memory card into the medical facility terminal in the pharmacy (step S801) to authenticate the patient with an ID and fingerprint (step S802). The person then checked the prescription data in the memory card by collating it with the prescription data in the database (step S803). If the data do not coincide with each other in step S802 or S803, the processing is interrupted, and the prescription is informed of the corresponding information.

[0106]

Since the data coincided with each other in steps S802 and S803, the person in charge handed insulin for one month to the patient A (step S804). This insulin is contained in a cartridge, and the medicine box that the prescription has received also contains an inhaling jig. It was checked that this medicine was supplied for the first time (step S805). Information such as the amount of insulin received, date, expiration date, intervals, and the like is written as medication data in both the memory card and the database (step S807). The memory card was then removed and returned to the patient (step S808).

[0107]

When the patient A returned home, a warning sound indicating a standard setting time was generated, and the patient A took out one of cartridges, each of which was packaged, from the received medicine box. The patient carefully opened the package and confirmed that no medicine leaked. The patient then loaded the cartridge into the inhaler. When the cartridge was mounted, the user terminal collated the prescription data written on the electronic clinical chart in the memory card with the information of the loaded cartridge and displayed the type of cartridge and the loading time on the display.

[0108]

As described with reference to steps S306 to S309 in Fig. 4, after the user was authenticated with an ID or fingerprint and inhaling/restoring operation was performed by using a jig, the user inhaled insulin and completed self-administration operation by inhalation. The date when the patient executed inhaling operation was stored in the memory card.

[0109]

When the patient periodically repeated such inhaling operation for several days, he/her felt ill on the road. The patient then went to a nearby drugstore by using the navigation function of the user terminal, measured his/her blood glucose level, and stored the measurement result in the memory card. Since the

measurement value was slightly higher than the normal value, the patient transferred the data stored in the memory card to the database, and contacted the doctor in charge by using the emergency notification function of the user terminal, thus asking for an instruction from the doctor through speech communication.

[0110]

Another day, the patient went to his/her accustomed drugstore because the insulin on hand began to run out, and found that the drugstore had run out of stock. The patient therefore went to a nearby drugstore having insulin in stock by searching for it using the navigation function. The patient received a new cartridge according to the above procedure described with reference to steps S801 to S804 in Fig. 8. In this case, since this medicine was not supplied for the first time, the flow advanced from step S805 to step S806 to return the used cartridge. At the drugstore terminal, the medication data in the memory card and database were updated, and the inventory data of the medicine was updated. The memory card was then returned to the patient.

[0111]

(2) Impotentia Erigendi Case

An impotentia erigendi case will be described next with reference to the flow charts of Figs. 7 and 8.

[0112]

A patient B went to a medical facility to receive a consultation. The patient removed a memory card from his/her user terminal and handed it to a doctor. The doctor inserts the memory card into an medical facility terminal (step S701) and performed a consultation (step 702). As a result of the consultation, the patient was diagnosed with impotentia erigendi. It was then determined on the basis of the consultation with the doctor that the patient would take gonadotrophic hormone by pulmonary inhalation for three months. It was determined that the medicine would be supplied weekly, and the patient would take the medicine at predetermined intervals which were determined by himself/herself as necessary. The above information was written in both the memory card and the electronic clinical chart in the database (step S703).

[0113]

The inhaler setting data about the patient B were registered in the memory card and database under the guidance of the doctor as described with reference to steps S302 to S304 in Fig. 4 (step S705). At the same time, data of a photo of the face and fingerprint were also written newly as authentication data.

[0114]

When the above processing was completed, the doctor created/updated prescription data (step S706), removed the patient's memory card from the medical

facility terminal, and returned it to the patient (step S707), thus completing the processing in the consultation.

[0115]

The patient B went to the pharmacy of the medical facility while carrying the user terminal 200, and handed the memory card to a person in charge in the pharmacy. The person in charge inserted the memory card into a medical facility installed in the pharmacy (step S801) to authenticate the patient with the ID and the photo of the face (step S802), and checked the prescription in the memory card by collating it with the prescription in the database (step S803). The person in charge then handed a medicine for one week to the patient B (step S804). This medicine is of a type that is exchanged with a new one in the form of a tank, and the received medicine box also contains an inhaling jig. The person determined that this medicine was supplied for the first time (step S805), and wrote medicine data such as the amount of medicine received, date, expiration date, and intervals in both the memory card and the database (step S807). The person removed the memory card and returned it to the patient (step S808).

[0116]

The patient B took out the tank from the medicine box and loaded it into the cartridge as needed, and

took the medicine by himself/herself by inhalation as in the case of (1) in accordance with a desired effect exertion time.

[0117]

The received medicine ran out one week after it was received, and hence the patient B went to the drugstore. The patient received a new tank according to the processing described with reference to steps S801 to S804 in Fig. 8. In this case, since the medicine was not supplied for the first time, the flow advanced from step S805 to step S806 to return the used tank. At the drugstore terminal, the medication data and the inventory data of the medicine in the memory card and database were updated, and the memory card was returned to the patient.

[0118]

(3) Person Who Wants to Quit Smoking

A case of a person who wants to quit smoking will be described next with reference to the flow charts of Figs. 7 and 8.

[0119]

A patient C went to a medical facility to have medical treatment with the aim of quitting smoking. The patient removed a memory card from this user terminal and handed it to a doctor. The doctor inserted the patient' memory card into an medical facility terminal (step S701) and made a medical

inquiry (step S702). The doctor determined on the basis of the medical inquiry and consultation that the prescription would take a medicine by pulmonary inhalation to reduce the nicotine intake step by step. It was determined that the medicine would be supplied weekly, and the maximum dose per day would be determined in accordance with a predetermined concentration decrease gradient. The above information was written in the memory card and the electronic clinical chart in the database (step S703).

[0120]

The inhaler setting data about the patient C were registered in the memory card and database under the guidance of the doctor as described with reference to steps S302 to S304 in Fig. 4 (step S705). At the same time, data of a photo of the face and fingerprint were also written newly as authentication data.

[0121]

In this case, the inhaler is controlled such that when the patient inhales the medicine at predetermined intervals or shorter intervals, the nicotine intake per day decreases, and the patient is inhibited from inhaling the medicine in amount exceeding the maximum dose per day. In addition, the inhaler is controlled such that even if the dose in the previous day is less than the maximum dose, the remaining amount of medicine is not added to the amount of medicine for the next

data.

[0122]

When the above processing is completed, prescription data is created/updated (step S706), and the patient's memory card is removed from the medical facility terminal and returned to the patient (step S707), thus terminating the processing at the time of consultation.

[0123]

The patient C went to the pharmacy of the medical facility while carrying the user terminal 200, and handed his/her own memory card to a person in charge in the pharmacy. This person inserted the memory card into the medical facility terminal installed in the pharmacy (step S801) to authenticate the patient with the ID and the photo of the face (step S802), and checked the prescription in the memory card by collating it with the prescription in the database (step S803). The person in charge then handed a medicine for one week to the patient C (step S804). This medicine is of a type that is exchanged with a new one in the form of a tank, and the received medicine box also contains an inhaling jig. The person determined that this medicine was supplied for the first time (step S805), and wrote medicine data such as the amount of medicine received, date, expiration date, and intervals in both the memory card and the database

(step S807). The person removed the memory card and returned it to the patient (step S808).

[0124]

The patient C took out the tank from the medicine box several times a day, loaded in into the cartridge, and took the medicine by himself/herself by pulmonary inhalation as in the case of (1) instead of smoking.

[0125]

The received medicine ran out one week after it was received, and hence the patient C went to another medical facility. A doctor inserted the memory card of the patient C into the medical facility terminal, set the maximum dose per day and the number of times of inhalation for each inhaling operation in accordance with the concentration decrease gradient set by reading out data from the electronic clinical chart of the patient C, and wrote a new prescription. In addition, the inhaler was adjusted in accordance with the new prescription.

[0126]

The patient received a new tank at the pharmacy of the medical facility according to the processing described with reference to steps S801 to S804 in Fig. 8 as in the above case. In this case, since the medicine was not supplied for the first time, the flow advanced from step S805 to step S806 to return the used tank. At the medical facility terminal of the pharmacy,

the medication data and the inventory data of the medicine in the memory card and database were updated, and the memory card was returned to the patient.

[0127]

(4) Inpatient

A case of an inpatient will be described next with reference to the flow chart of Fig. 10.

[0128]

In a periodic medical checkup, a stomach cancer in a patient D was found. The patient therefore went to a medical facility to take ablation surgery. In the medical facility, a doctor inserted the patient's memory card into a medical facility terminal (step S1101) to diagnose the case by reading out past medical checkup result and stomach X-ray photograph images, and performed an operation (step S1102).

[0129]

The doctor created an electronic clinical chart including a medical treatment after the operation on the basis of the operation result (step S1103). The memory card of the patient D was moved to a bed-side terminal attached to a bed in the hospital in which the patient D would stay (step S1104), and persons in charge, e.g., a doctor and nurse, were registered (step S1105).

[0130]

This bed-side terminal is a modification of the

medical facility terminal 110, and has almost the same arrangement as that of the user terminal 200 except that the inhaler 202 is omitted. However, this terminal has a wide display for better viewability. The name of the patient, the name of disease, and the symptom are always displayed on this display screen.

[0131]

For everyday treatment performed by the doctor or nurse, he/she identifies the patient according to the name and symptom displayed on the display screen (step S1106), and inputs the ID of the doctor or nurse to read out the electronic clinical chart (step S1107). The doctor then makes his rounds or the doctor or nurse performs a necessary check or measurement (step S1108). The prescription data is updated on the basis of the resultant data (step S1109).

[0132]

When a predetermined period of time has elapsed, the condition of the patient improved, and the patient was given a permission to leave the hospital (step S1110). When the patient left the hospital, the memory card was returned to him/her (step S1111).

[0133]

[Effects of Embodiment]

As has been described above, this embodiment has the following effects.

[0134]

(1) Various personal data and medical data are electronized and stored in the database, and hence efficient medical practices can be expected by information sharing.

[0135]

(2) Personal data about privacy can be protected by setting an access right for each terminal and personal identification.

[0136]

(3) Since each user terminal has the emergency notification mode, emergencies can be properly and quickly handled.

[0137]

(4) Administering a medicine by using the inhaler of a user terminal instead of injection as in the prior art allows a patient himself/herself to easily take the medicine, thus reducing his/her mental and physical burdens.

[0138]

(5) In discharging a medicine from the inhaler, the driving parameters are changed in accordance with the inhalation rate and the like to send a large amount of medicine to the lungs, thereby improving the inhalation efficiency.

[0139]

(6) In administering a medicine by using the inhaler, the medicine can be efficiently administered

by performing proper discharging control in accordance with the amount of air inhaled by each patient and the profile.

[0140]

(7) When a patient takes a medicine by himself/herself, the patient can be prevented from loading a wrong medicine or erroneously operating the inhaler.

[0141]

(8) With the controller of a user terminal, the dose of a medicine and medication intervals can be accurately managed in accordance with prescription data.

[0142]

(9) Since the supply and administration of medicines are recorded, the medicines used by each patient and inventories can be accurately managed. In addition, used cartridges and tanks can be accurately collected.

[0143]

(10) Prescription data is also stored in the memory card of each user terminal. This allows each user to receive medicines according to a prescription by reading the data regardless of the area where he/she is located.

[0144]

(11) The navigation function of each user terminal facilitates access to a nearby or suitable

medical facility or drugstore.

[0145]

[Other Embodiment]

The above embodiment has exemplified the medical health management system. However, the present invention can be applied to various other applications.

[0146]

For example, the present invention may be applied to a system for instructing each user to regularly practice diet and exercise for health and beauty in accordance with a preset program by using a user terminal similar to the one described above and a terminal installed in a sports club or the like, or the above inhaler of the user terminal may be used to take proper amounts of vitamins and minerals, other than medicines, which are necessary for health.

[0147]

When the present invention is used for such an application other than medical applications, the data stored in the database and each terminal and the function of each user terminal are changed as needed.

[0148]

In addition, the present invention can be used as a medical health management system in such a manner that the above inhaler of the user terminal is used for an inhalation treatment for an asthmatic patient or to administer a medicine into the patient's body, which is

currently administered by injection or in the form of an internal medicine.

[0149]

The arrangement of the health management system is not limited to the above embodiments. For example, the database may be incorporated in the medical facility terminal.

[0150]

[Effect of the Invention]

As described hereinbefore, according to the present invention, in administering a medicine by using the inhaler, a patient can be prevented from loading a wrong medicine and erroneously operating the inhaler, and the patient can accurately and easily take a medicine by himself/herself.

[Brief Description of the Drawings]

[Fig. 1]

Fig. 1 is a block diagram showing the overall arrangement of a medical health management system according to an embodiment of the present invention.

[Fig. 2]

Fig. 2 is a view showing data to be handled in the embodiment shown in Fig. 1.

[Fig. 3]

Fig. 3 is a block diagram showing the arrangement of a user terminal in the embodiment shown in Fig. 1.

[Fig. 4]

Fig. 4 is a flow chart showing inhaling operation using the user terminal shown in Fig. 3.

[Fig. 15]

Fig. 5 is a view showing the flow of a medicine in the embodiment shown in Fig. 1.

[Fig. 6]

Fig. 6 is a view showing the flow of data in the embodiment shown in Fig. 1.

[Fig. 7]

Fig. 7 is a flow chart showing processing in a consultation using a medical facility terminal.

[Fig. 8]

Fig. 8 is a flow chart showing processing in medicine supply.

[Fig. 9]

Fig. 9 is a view for explaining an emergency notification mode.

[Fig. 10]

Fig. 10 is a flow chart showing processing for an inpatient.

[Description of the Reference Numerals]

100 database

110 medical facility terminal

120 pharmaceutical company terminal

130 drugstore terminal

200 portable terminal

201 controller

202 inhaler

203 communication unit

204 internal memory

205 memory card

206 I/O interface

207 key switches

208 display/speech output unit

209 authentication sensor

250 external input/output devices

2021 control unit

2022 cartridge

2022A discharge head

2022B tank

2023 sensor

[Type Of The Document] Abstract

[Abstract]

[Object] To provide an inhaler and a discharge head control method, which can prevent a patient from loading a wrong medicine and erroneously operation.

[Means of Achieving the Object] In an inhaler 200 having memory card 205 storing personal information about the user including information about a prescription for the user, a tank 2022B which contains the medicine and has a code for identifying a type of contained medicine, and a discharge head 2922A for discharging a medicine supplied from the tank in the form of fine droplets, operation of the discharge head 2022A can be permitted only when a collation result on the medicine contained in the tank 2022B and a medicine written on the prescription indicates coincidence upon reading the code.

[Selected Drawing] Fig. 3

FIG. 1

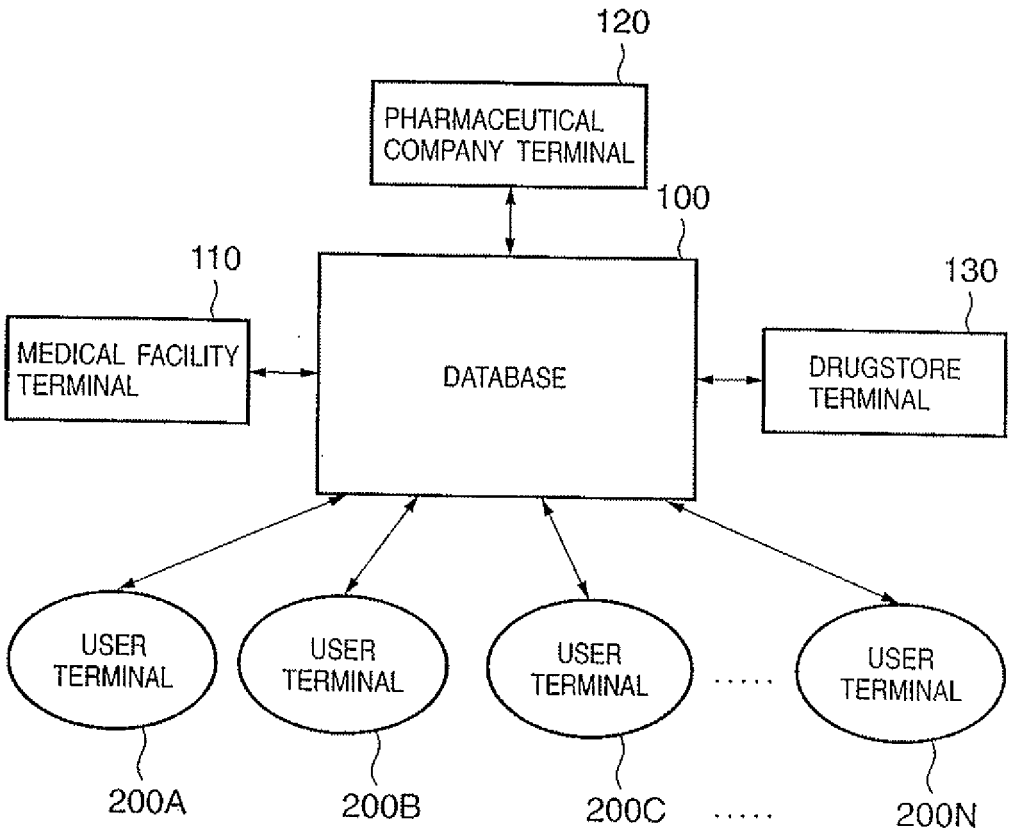

120
PHARMACEUTICAL COMPANY TERMINAL
100
110
130
MEDICAL FACILITY TERMINAL
DATABASE
DRUGSTORE TERMINAL
USER TERMINAL
USER TERMINAL
USER TERMINAL
USER TERMINAL
200A
200B
200C
200N

FIG. 2

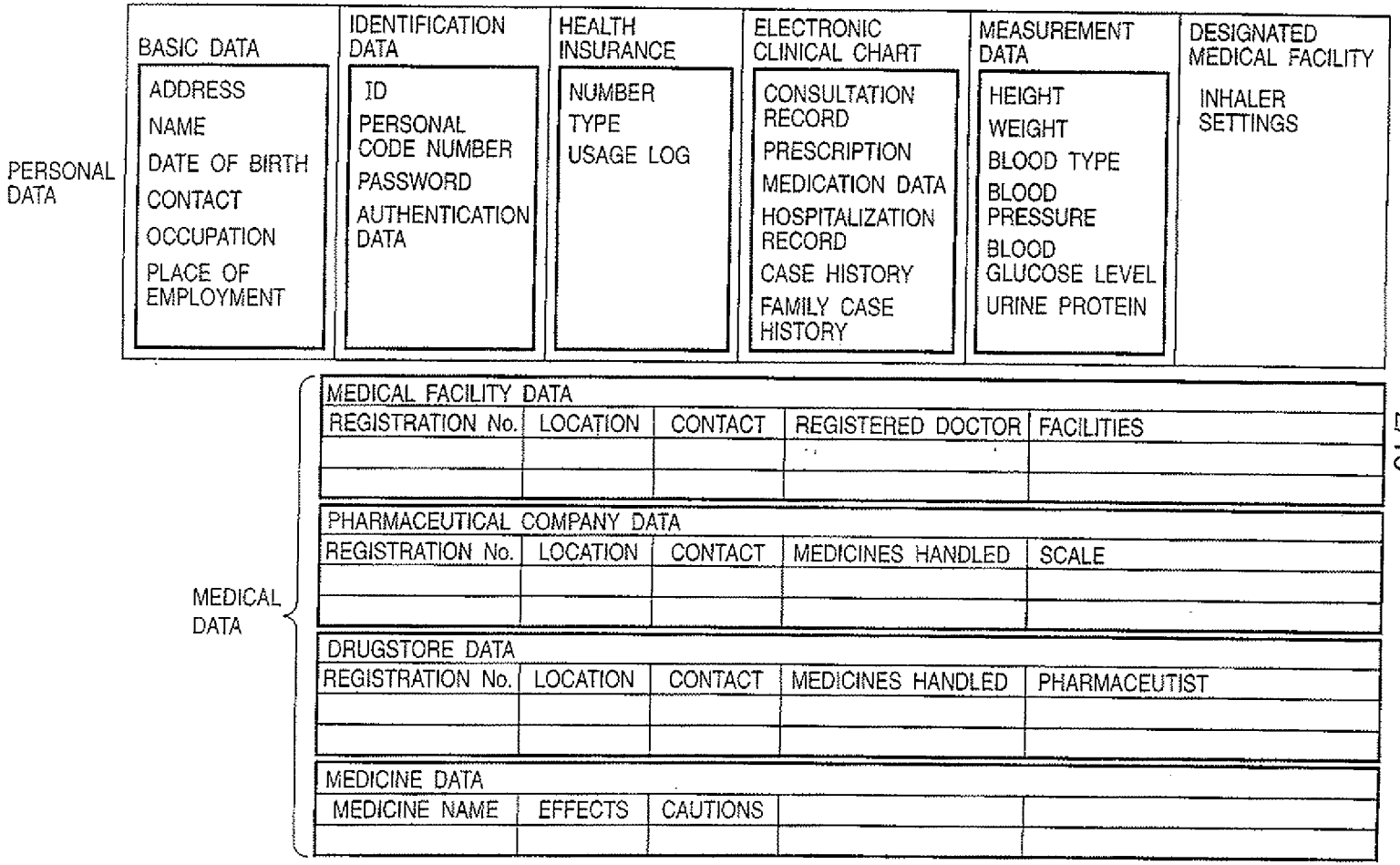

PERSONAL DATA
BASIC DATA
ADDRESS
NAME
DATE OF BIRTH
CONTACT
OCCUPATION
PLACE OF EMPLOYMENT
IDENTIFICATION DATA
ID
PERSONAL CODE NUMBER
PASSWORD
AUTHENTICATION DATA
HEALTH INSURANCE
NUMBER
TYPE
USAGE LOG
ELECTRONIC CLINICAL CHART
CONSULTATION RECORD
PRESCRIPTION
MEDICATION DATA
HOSPITALIZATION RECORD
CASE HISTORY
FAMILY CASE HISTORY
MEASUREMENT DATA
HEIGHT
WEIGHT
BLOOD TYPE
BLOOD PRESSURE
BLOOD GLUCOSE LEVEL
URINE PROTEIN
DESIGNATED MEDICAL FACILITY
INHALER SETTINGS
MEDICAL DATA
MEDICAL FACILITY DATA
REGISTRATION No. | LOCATION | CONTACT | REGISTERED DOCTOR | FACILITIES
PHARMACEUTICAL COMPANY DATA
REGISTRATION No. | LOCATION | CONTACT | MEDICINES HANDLED | SCALE
DRUGSTORE DATA
REGISTRATION No. | LOCATION | CONTACT | MEDICINES HANDLED | PHARMACEUTIST
MEDICINE DATA
MEDICINE NAME | EFFECTS | CAUTIONS

FIG. 3

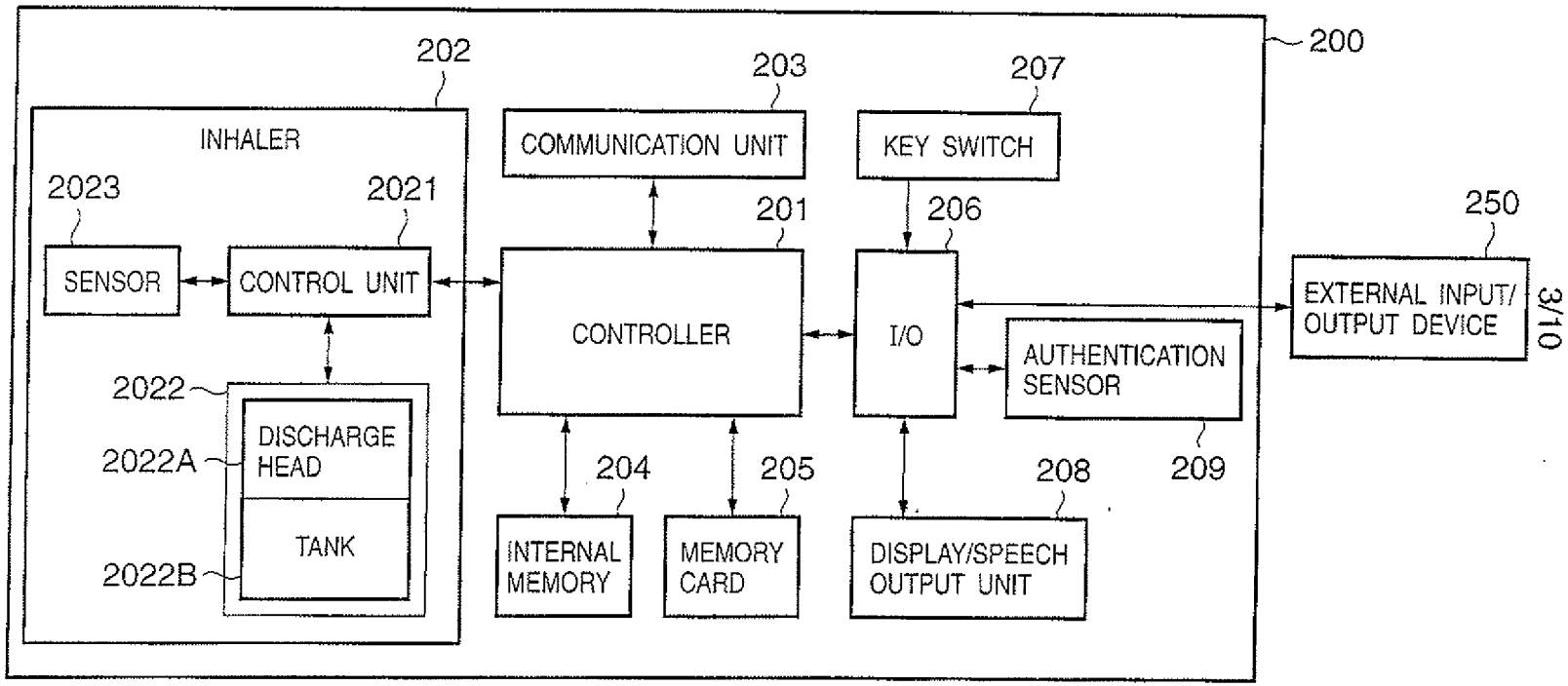

200
202
INHALER
2023
SENSOR
2021
CONTROL UNIT
2022
2022A
DISCHARGE HEAD
TANK
2022B
203
COMMUNICATION UNIT
201
CONTROLLER
204
INTERNAL MEMORY
205
MEMORY CARD
207
KEY SWITCH
206
I/O
208
DISPLAY/SPEECH OUTPUT UNIT
AUTHENTICATION SENSOR
209
250
EXTERNAL INPUT/ OUTPUT DEVICE

FIG. 4

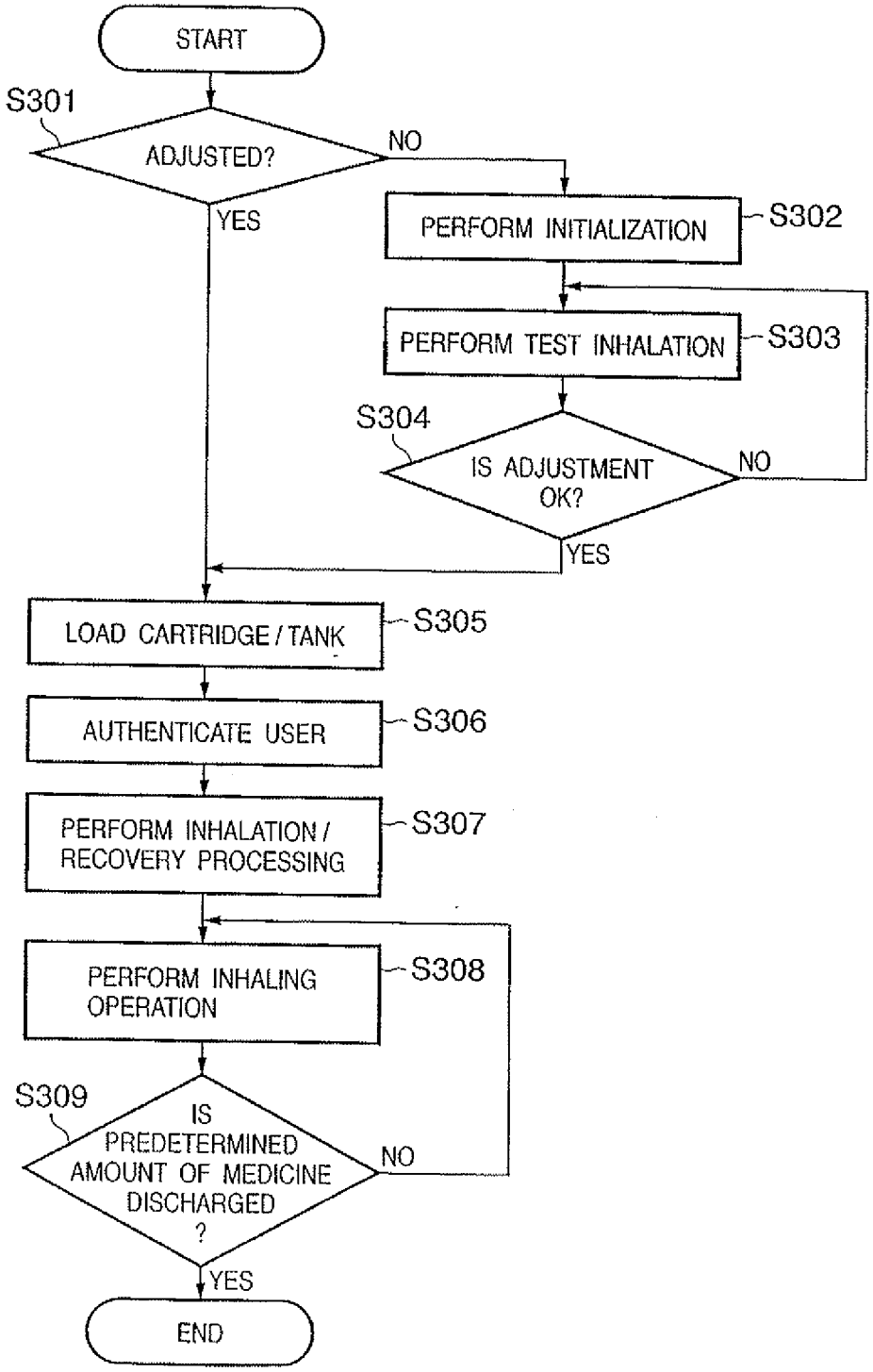

START
S301
ADJUSTED?
NO
YES
PERFORM INITIALIZATION
S302
PERFORM TEST INHALATION
S303
S304
IS ADJUSTMENT OK?
NO
YES
LOAD CARTRIDGE / TANK
S305
AUTHENTICATE USER
S306
PERFORM INHALATION / RECOVERY PROCESSING
S307
PERFORM INHALING OPERATION
S308
S309
IS PREDETERMINED AMOUNT OF MEDICINE DISCHARGED ?
NO
YES
END

FIG. 5

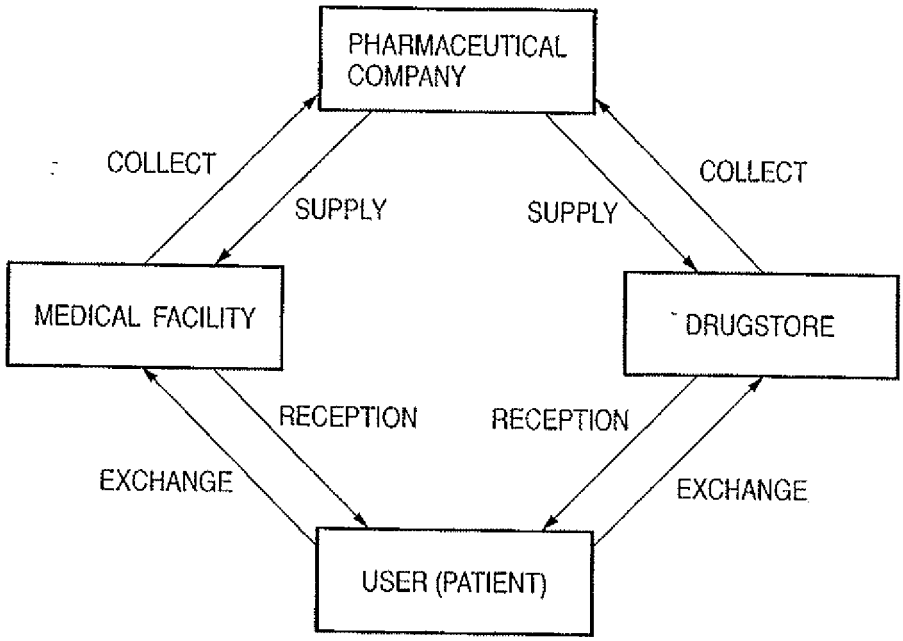

PHARMACEUTICAL COMPANY
COLLECT
SUPPLY
SUPPLY
COLLECT
MEDICAL FACILITY
DRUGSTORE
RECEPTION
RECEPTION
EXCHANGE
EXCHANGE
USER (PATIENT)

FIG. 6

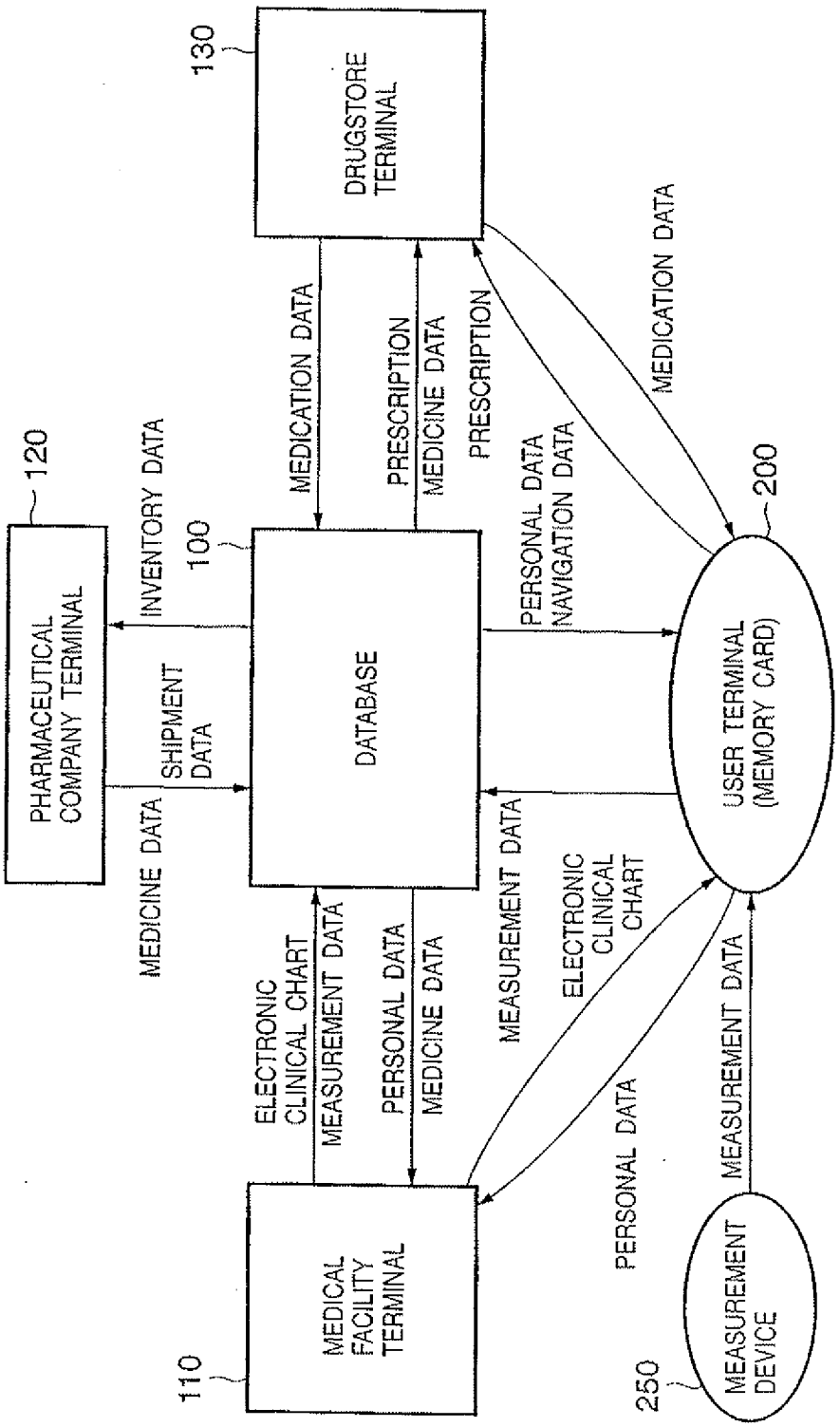

PHARMACEUTICAL COMPANY TERMINAL
120
DRUGSTORE TERMINAL
130
DATABASE
100
USER TERMINAL (MEMORY CARD)
200
MEDICAL FACILITY TERMINAL
110
MEASUREMENT DEVICE
250
INVENTORY DATA
SHIPMENT DATA
MEDICINE DATA
MEDICATION DATA
PRESCRIPTION
MEDICINE DATA
PRESCRIPTION
MEDICATION DATA
PERSONAL DATA
NAVIGATION DATA
ELECTRONIC CLINICAL CHART
MEASUREMENT DATA
PERSONAL DATA
MEDICINE DATA
MEASUREMENT DATA
ELECTRONIC CLINICAL CHART
PERSONAL DATA
MEASUREMENT DATA

FIG. 7

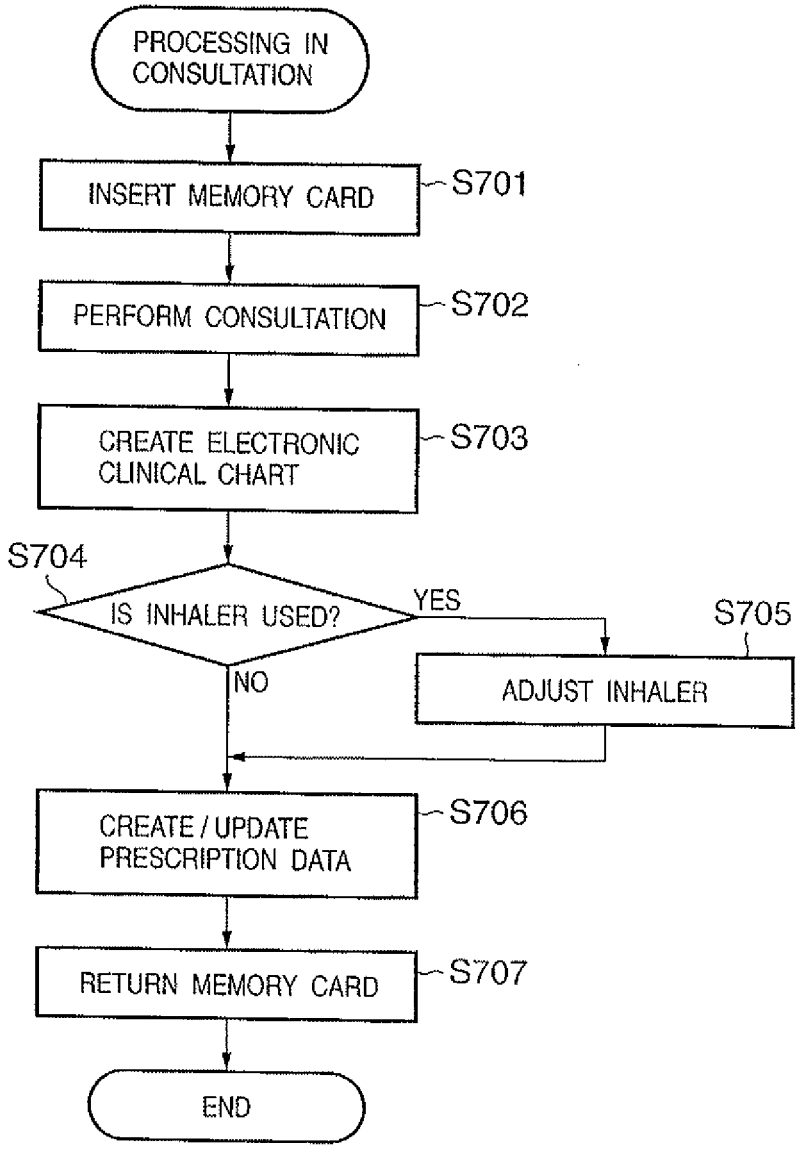

PROCESSING IN CONSULTATION
INSERT MEMORY CARD
S701
PERFORM CONSULTATION
S702
CREATE ELECTRONIC CLINICAL CHART
S703
S704
IS INHALER USED?
YES
S705
ADJUST INHALER
NO
CREATE / UPDATE PRESCRIPTION DATA
S706
RETURN MEMORY CARD
S707
END

FIG. 8

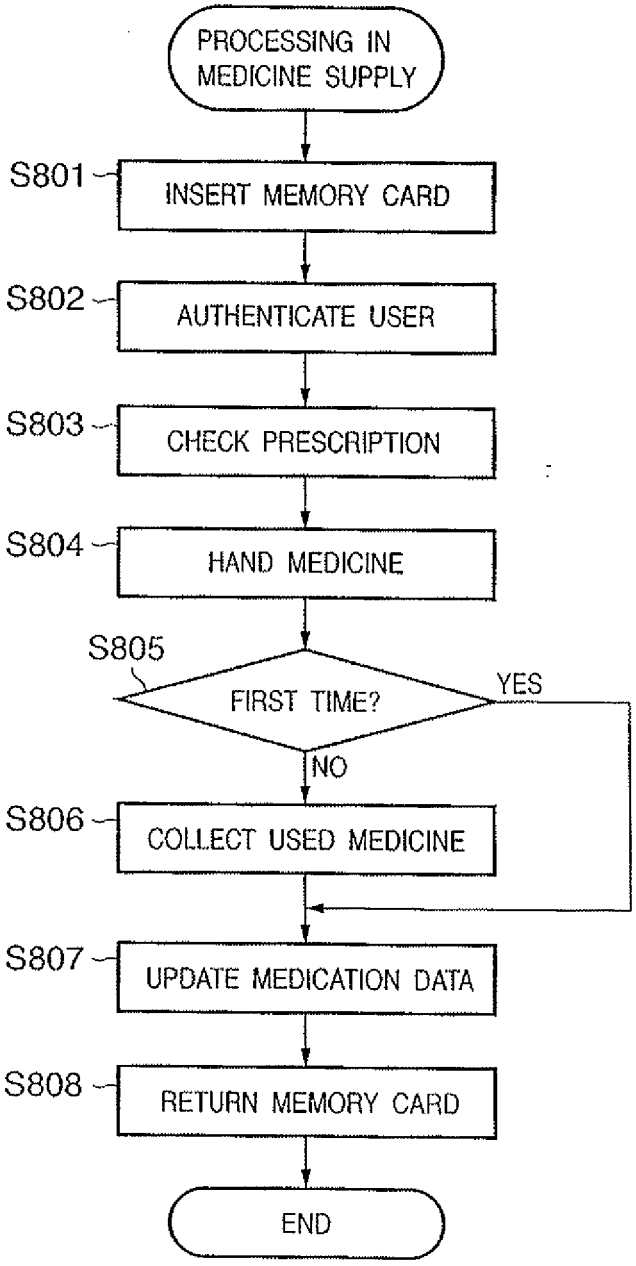

PROCESSING IN MEDICINE SUPPLY
S801
INSERT MEMORY CARD
S802
AUTHENTICATE USER
S803
CHECK PRESCRIPTION
S804
HAND MEDICINE
S805
FIRST TIME?
YES
NO
S806
COLLECT USED MEDICINE
S807
UPDATE MEDICATION DATA
S808
RETURN MEMORY CARD
END

FIG. 9

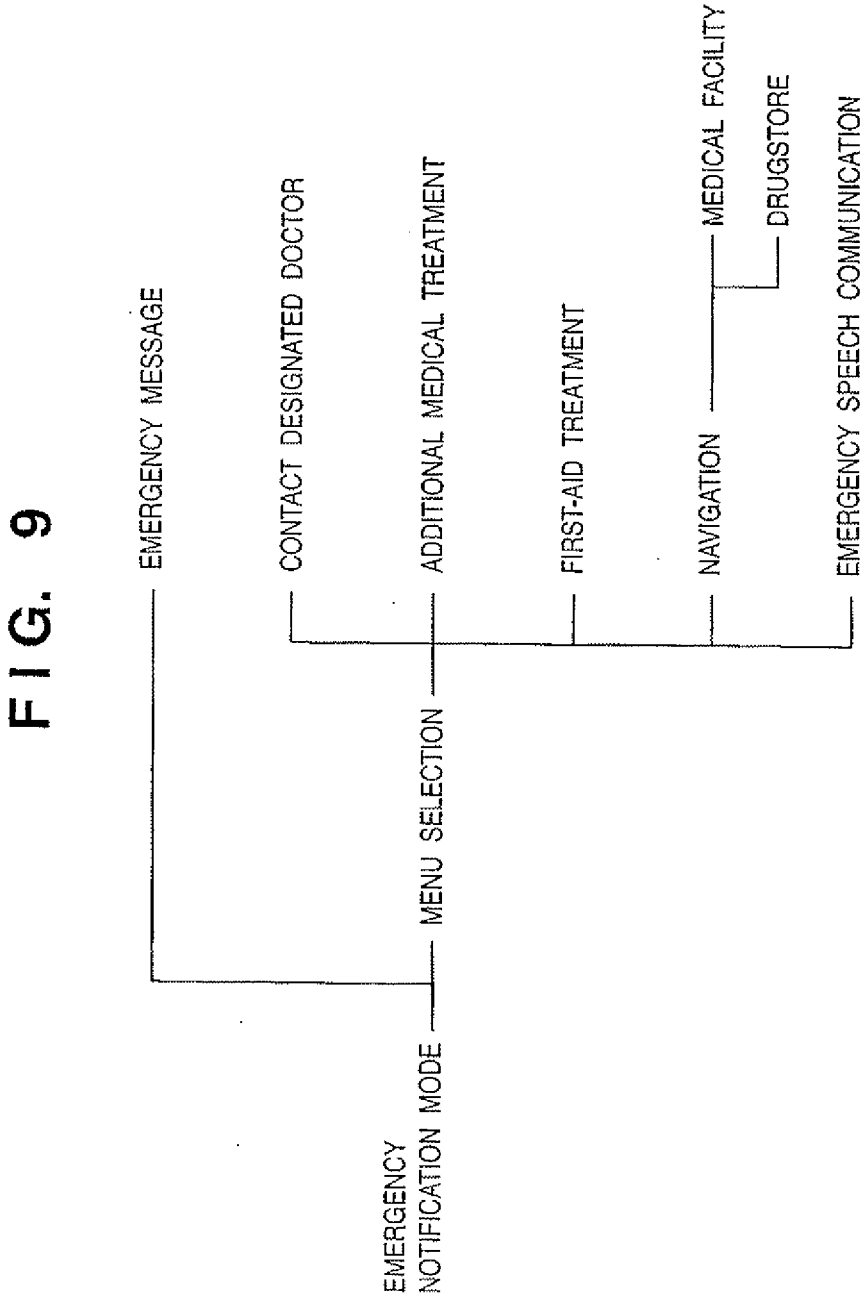
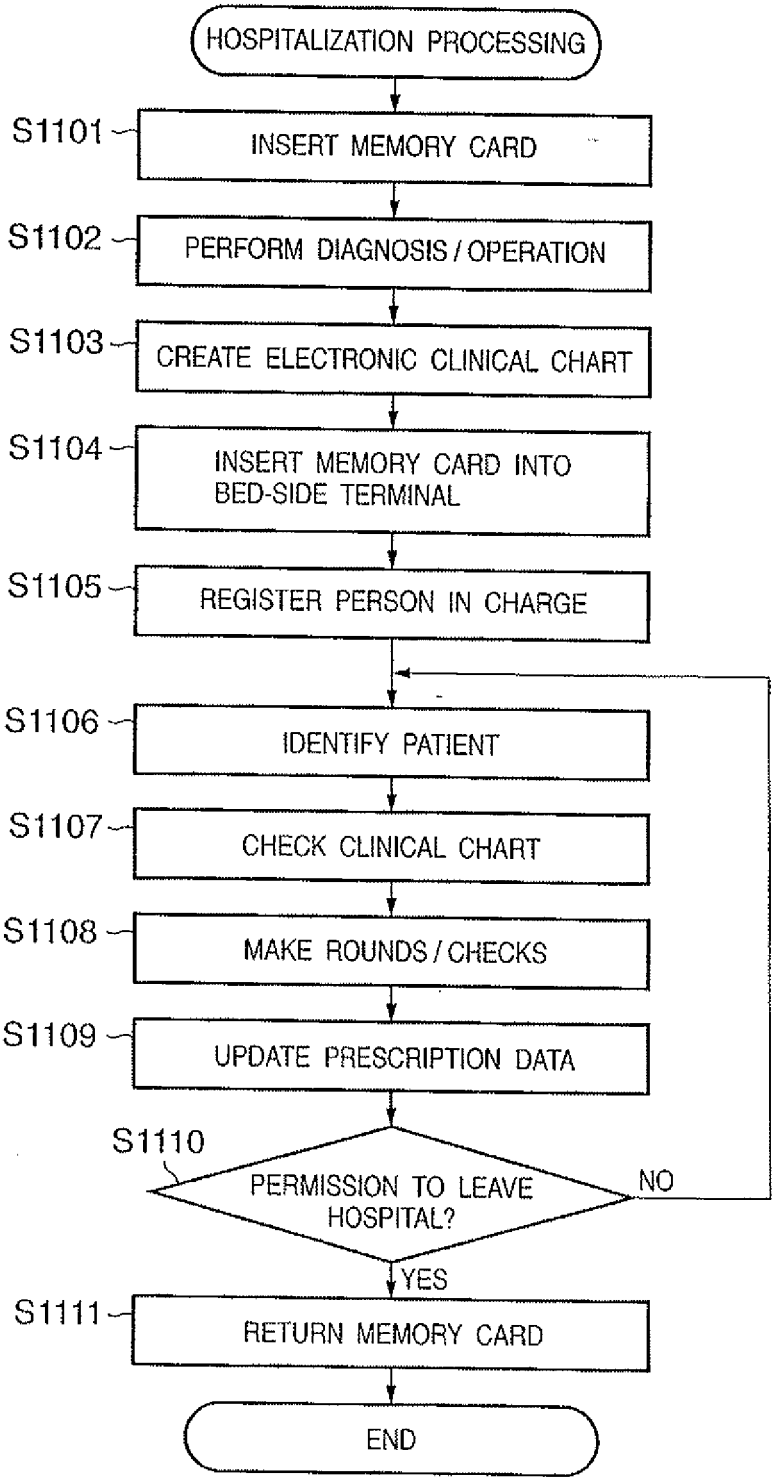

EMERGENCY NOTIFICATION MODE
MENU SELECTION
EMERGENCY MESSAGE
CONTACT DESIGNATED DOCTOR
ADDITIONAL MEDICAL TREATMENT
FIRST-AID TREATMENT
NAVIGATION
MEDICAL FACILITY
DRUGSTORE
EMERGENCY SPEECH COMMUNICATION

FIG. 10


HOSPITALIZATION PROCESSING
S1101
INSERT MEMORY CARD
S1102
PERFORM DIAGNOSIS / OPERATION
S1103
CREATE ELECTRONIC CLINICAL CHART
S1104
INSERT MEMORY CARD INTO BED-SIDE TERMINAL
S1105
REGISTER PERSON IN CHARGE
S1106
IDENTIFY PATIENT
S1107
CHECK CLINICAL CHART
S1108
MAKE ROUNDS / CHECKS
S1109
UPDATE PRESCRIPTION DATA
S1110
PERMISSION TO LEAVE HOSPITAL?
NO
YES
S1111
RETURN MEMORY CARD
END